

Forward energy and UE&MB modeling

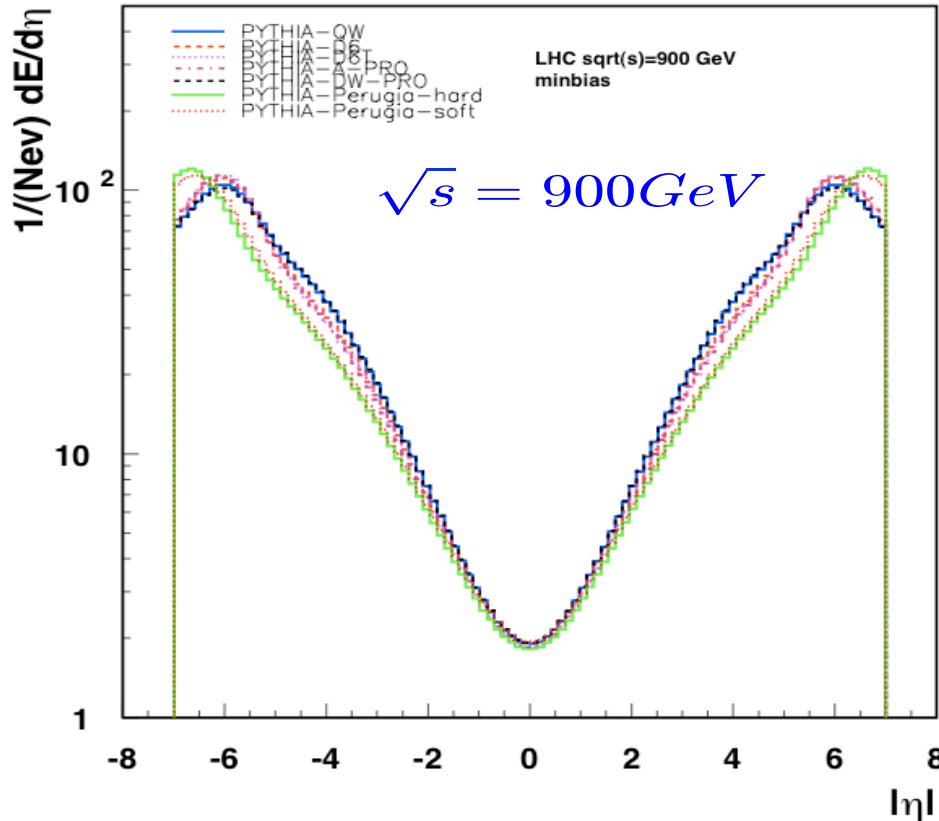
- What can be done with energy flow measurement in forward region ?
- Extracting diffraction and non-diffractive contribution
- Validating models of parton radiation in forward region: multiparton radiation and/or small x effects

with help from Michele Arneodo, Antonio Vilela Pereira,
Krzysztof Piotrkowski, Alexander Proskuryakov

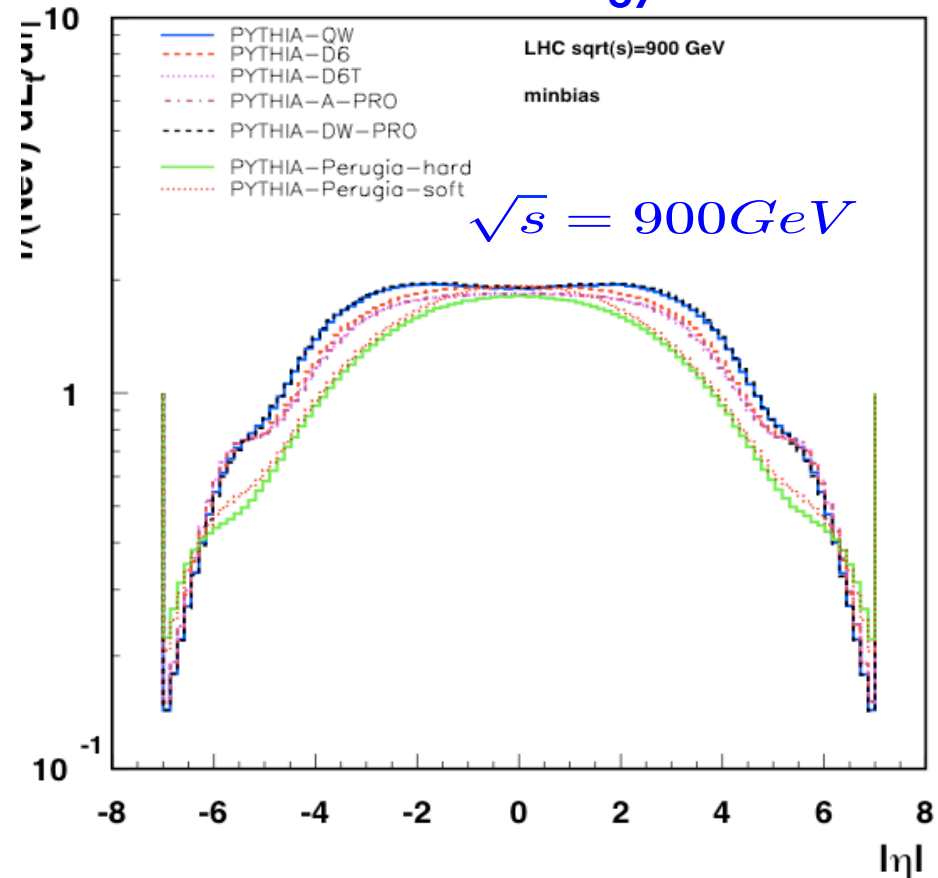
PS: no data are shown....

Energy flow at 900 GeV

Energy flow



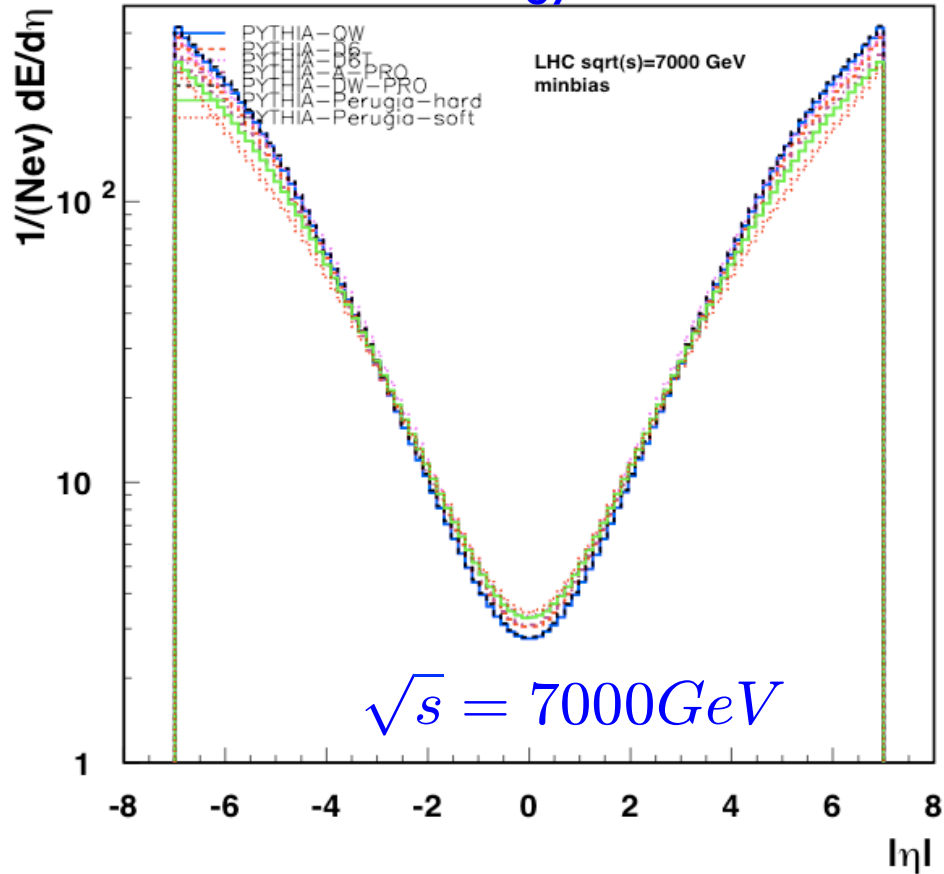
transverse Energy flow



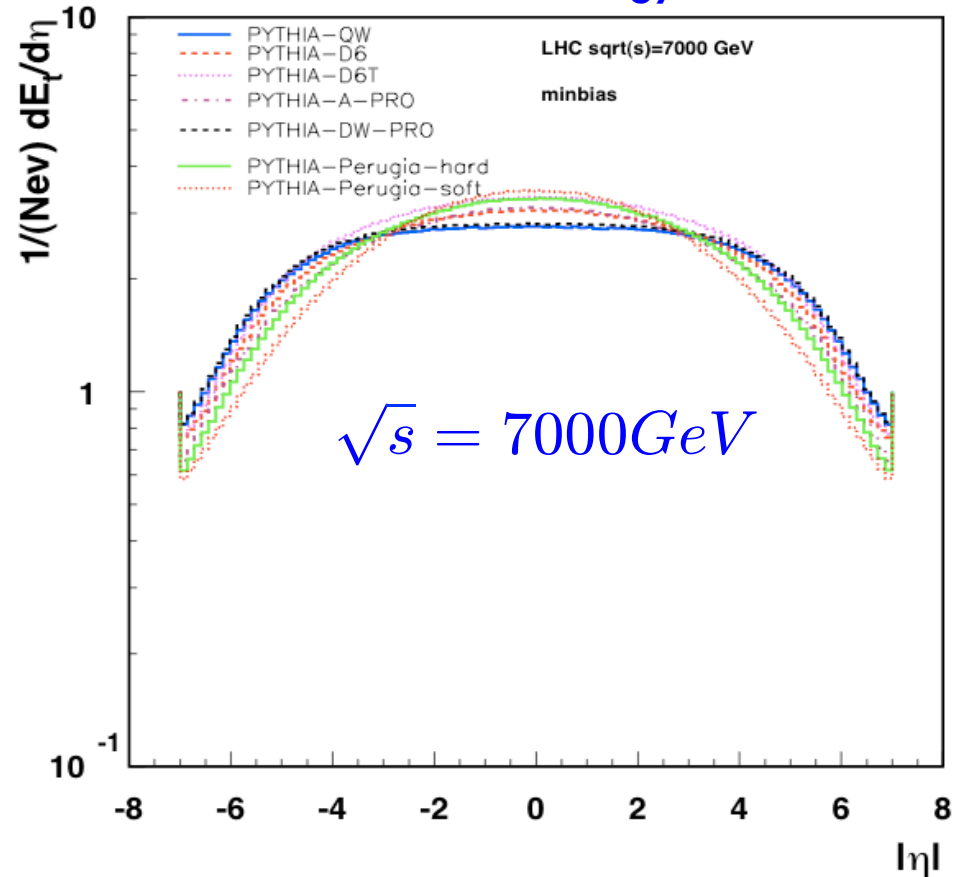
- energy flow in central region at low \sqrt{s} does not change much with tunes
- Significant effects visible in forward/backward region $|\eta| > 2$
- use this for tuning of parameters

energy flow at 7000 GeV

Energy flow

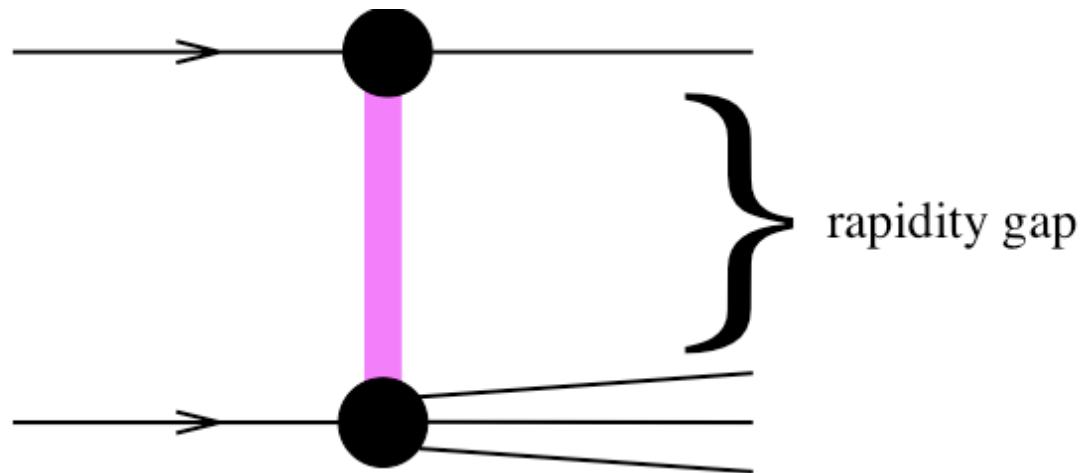


transverse Energy flow



- Energy flow in central region at large \sqrt{s} depends on tunes
- Still large effects visible in forward/backward region $|\eta| > 2$
- "All" tunes give different results \rightarrow use it for tuning

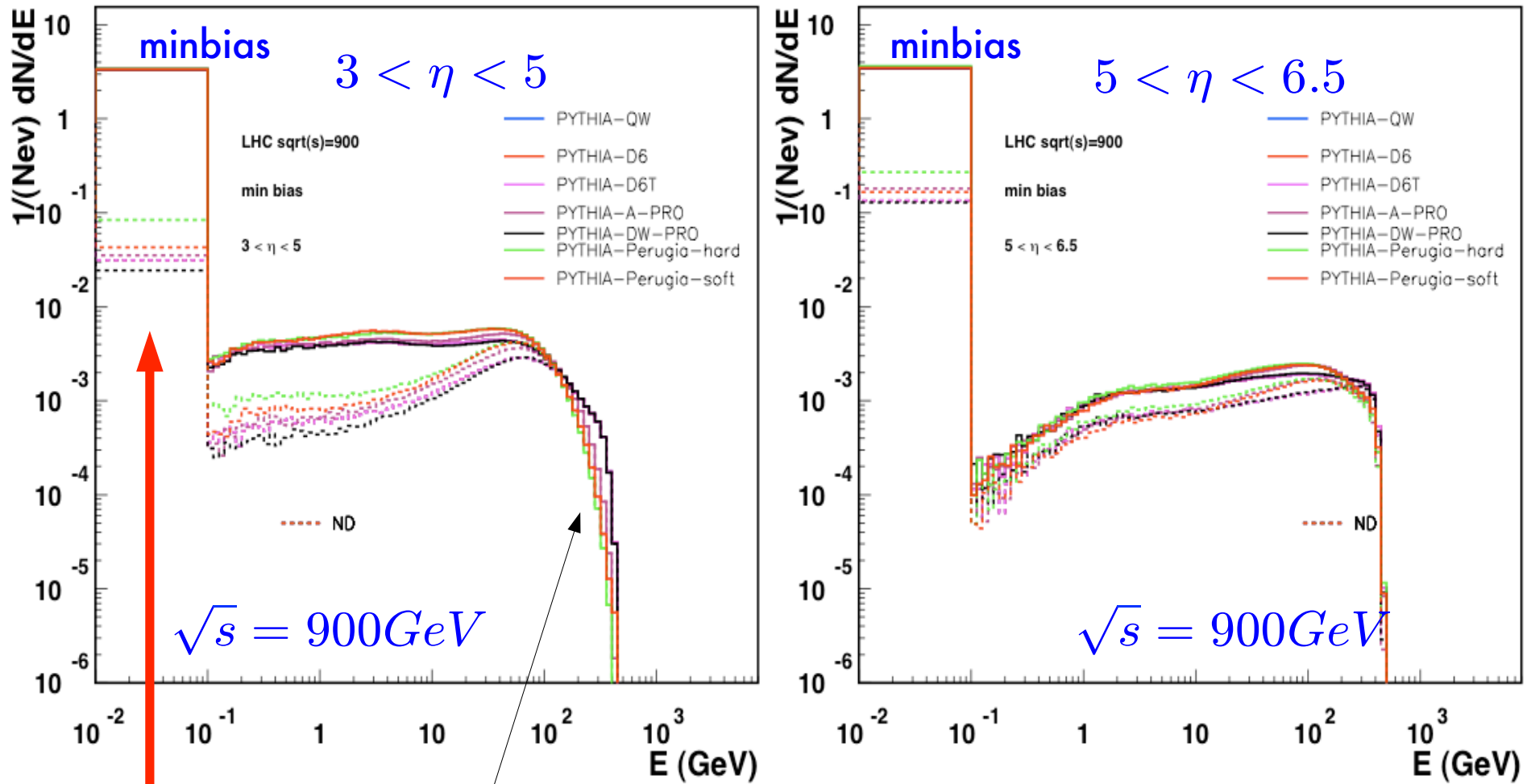
Looking for diffraction



diffraction:

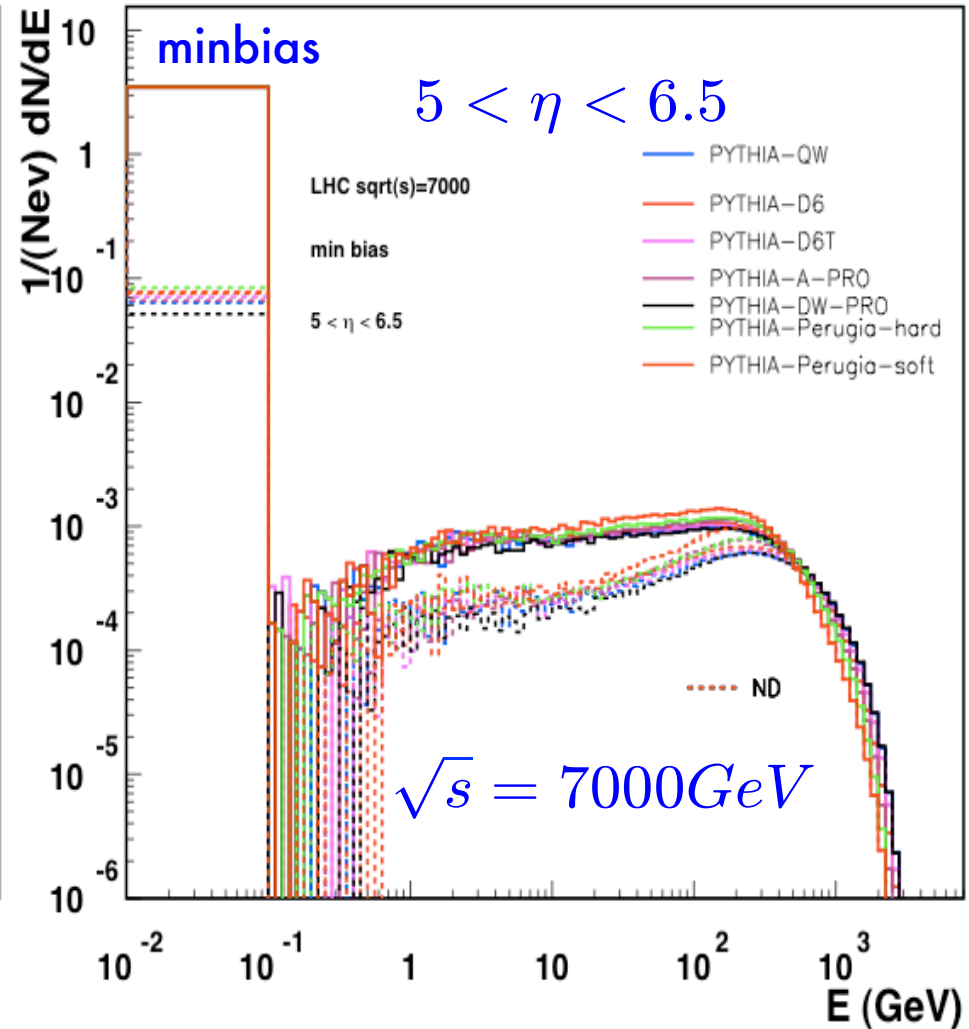
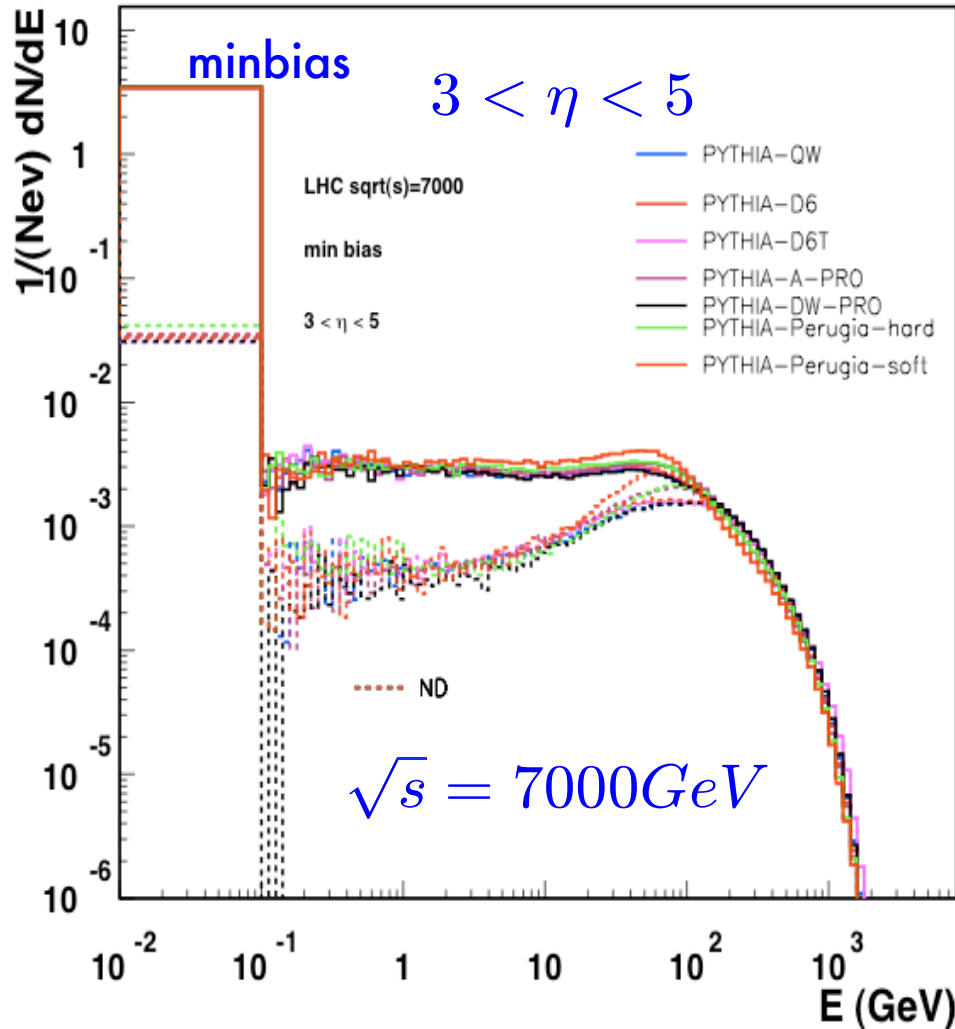
- identified by rapidity gap
- little energy deposit in forward regions
- make use of forward calorimetric coverage

Looking for diffraction ...



- Diffraction: rapidity gaps \rightarrow no energy deposition in forward calos
- Amount of non-diffractive contribution changes with different tunes
- but also high energy region depends on tunes...

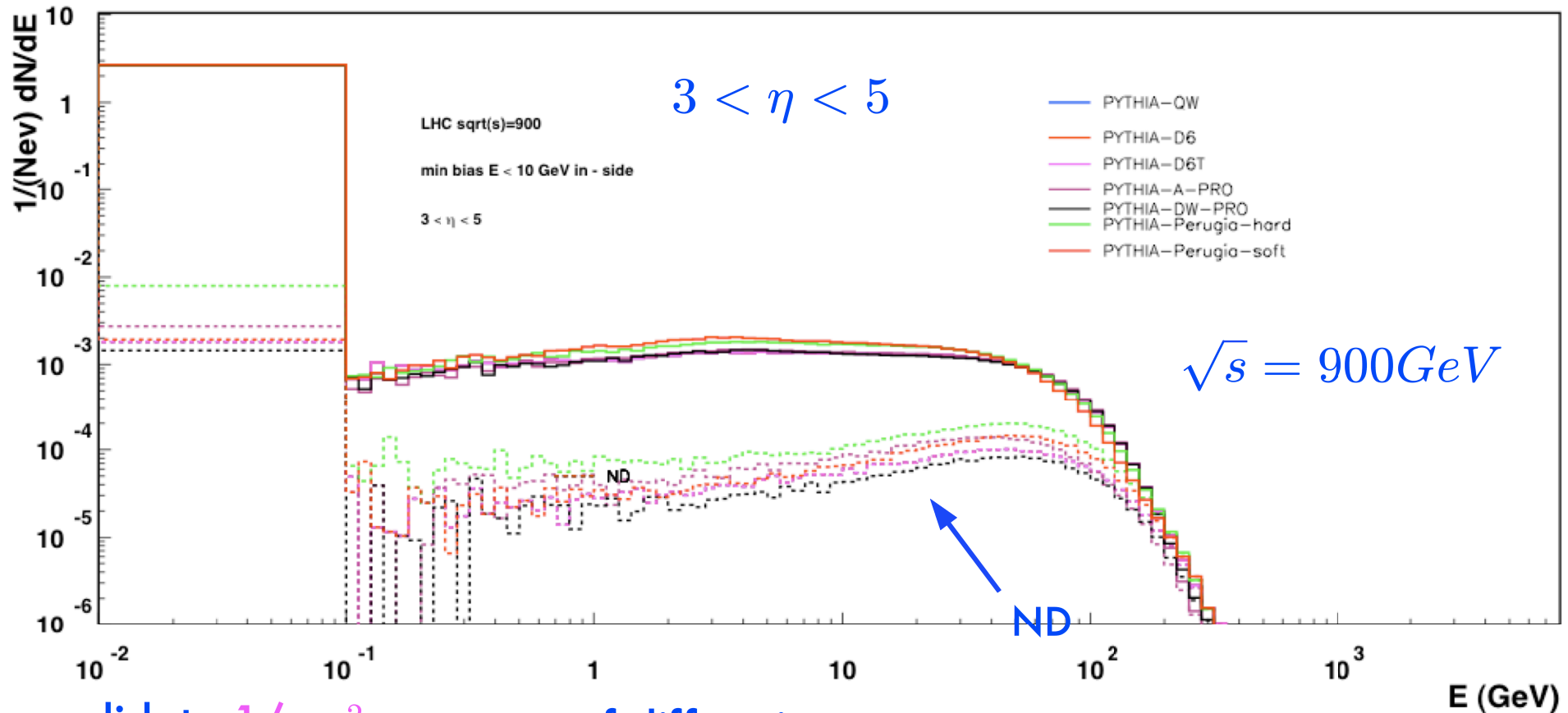
Looking for diffraction ...



- differences seen at low energies are smeared at large $\sqrt{s} = 7 \text{ GeV}$
- diffractive and ND contributions are similar between tunes

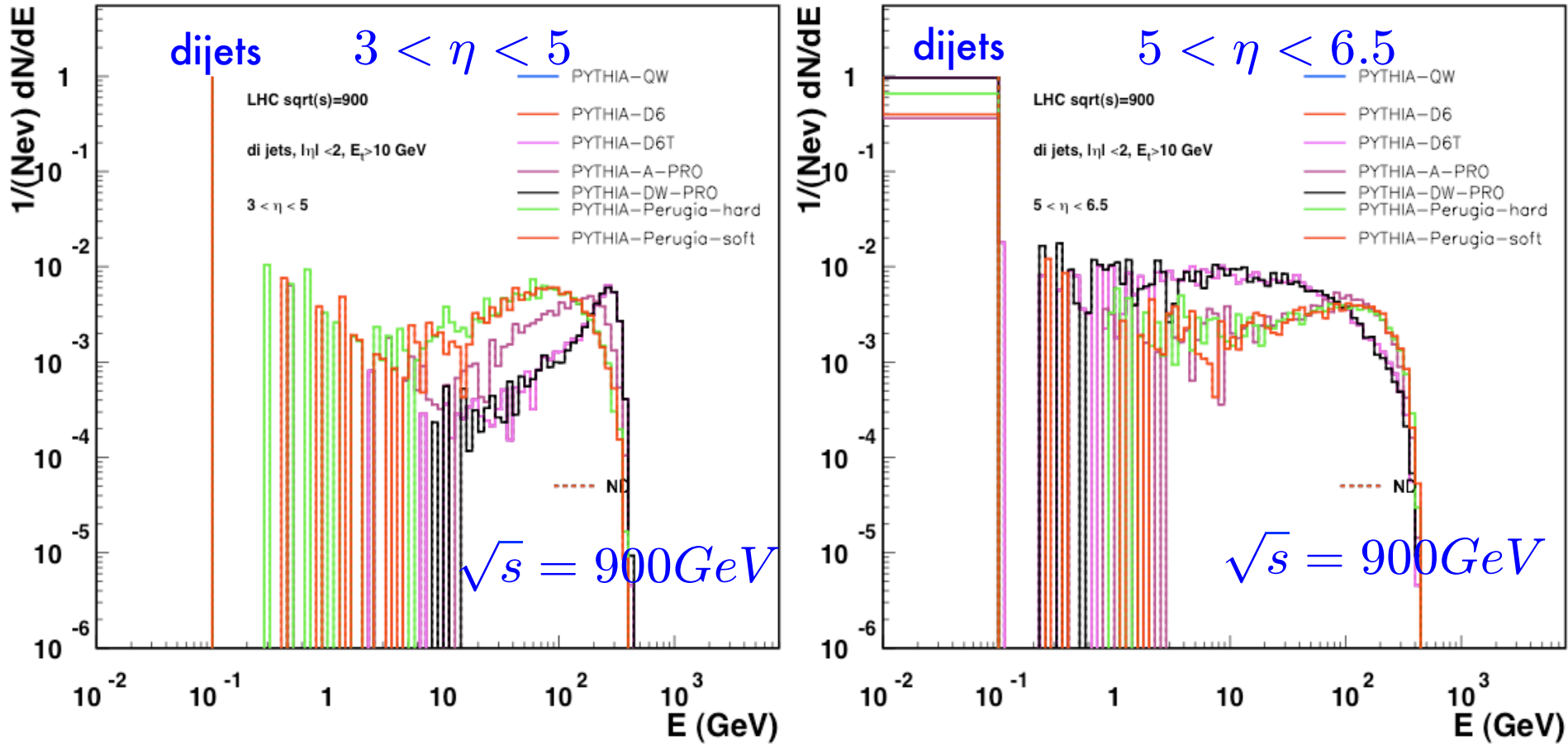
Selecting diffraction

- select diffraction with $E < 10$ GeV in $-5 < \eta < -3$



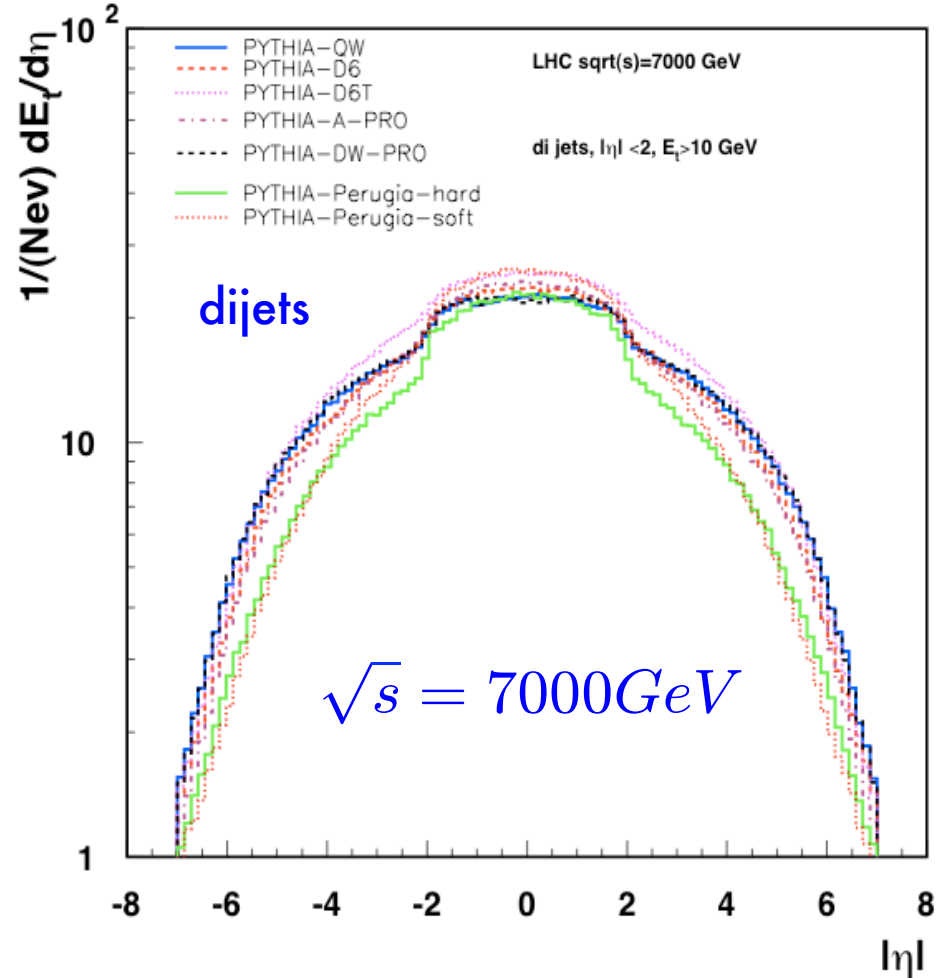
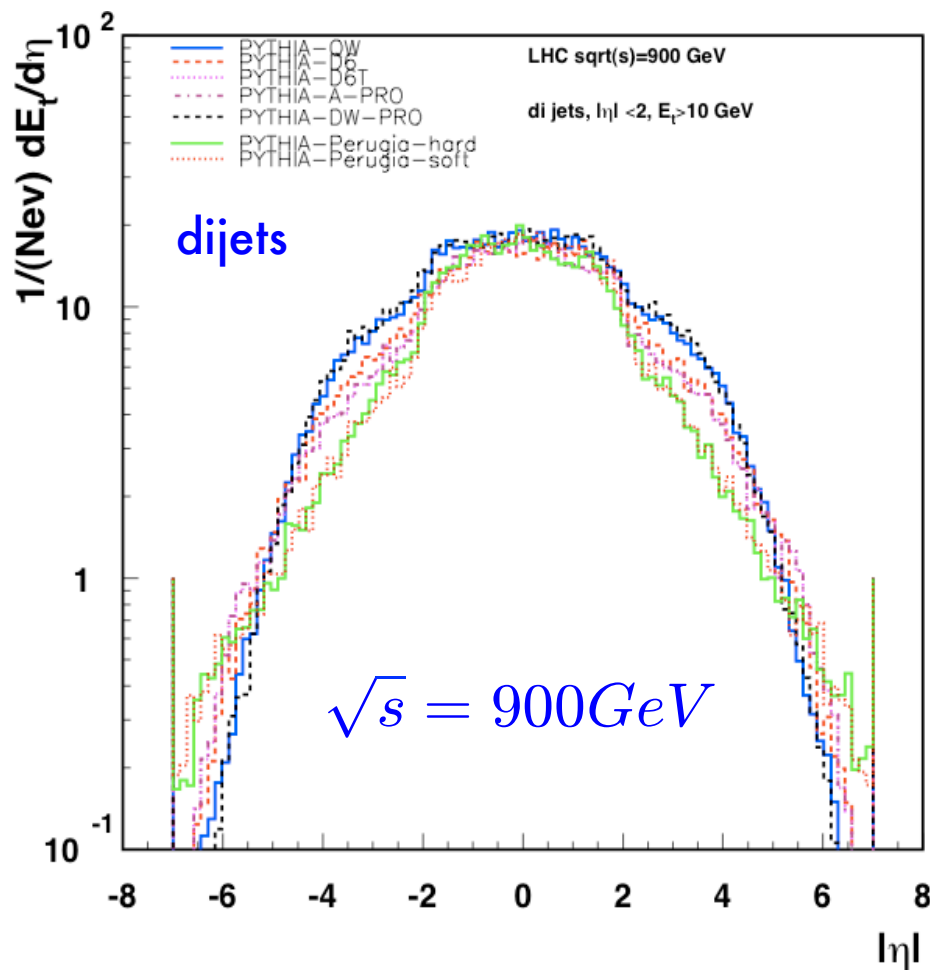
- validate $1/M_x^2$ spectrum of diffraction
- estimate contribution from diffraction and non - diffraction
- NOTE: spectrum in PHOJET is different ...**

Using a hard scale



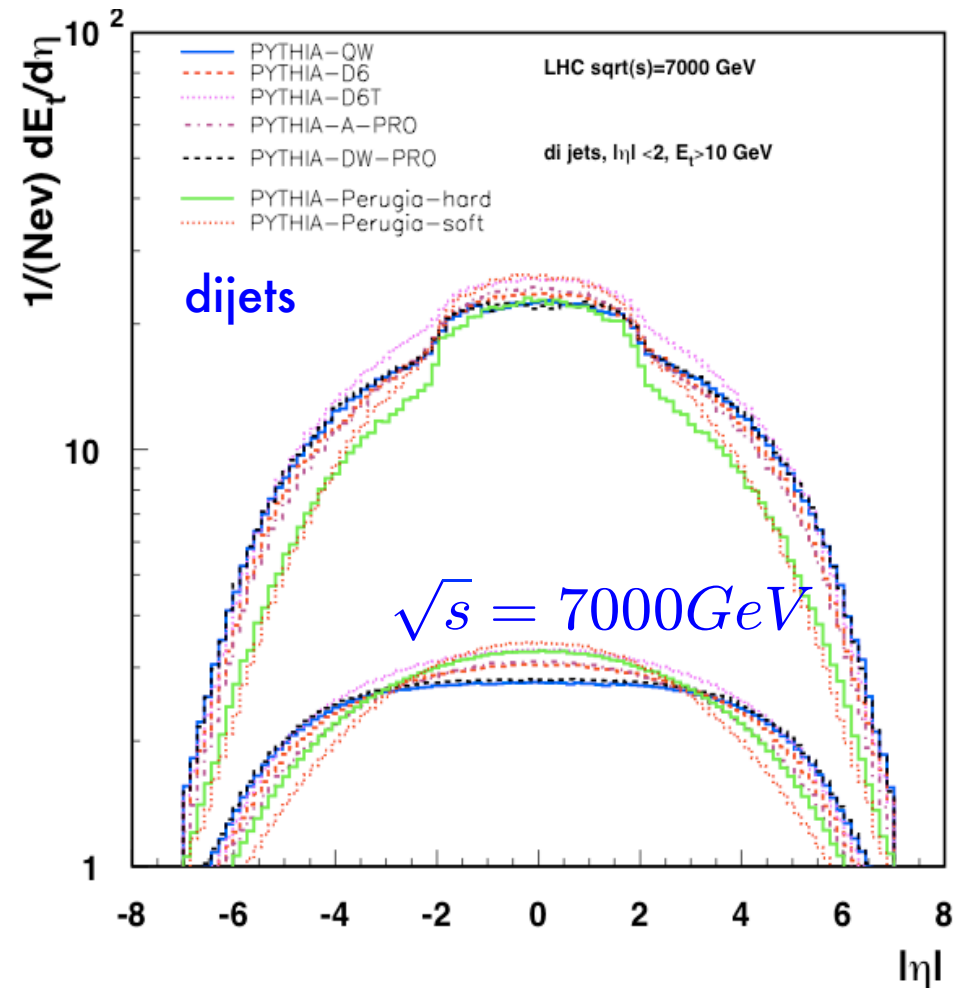
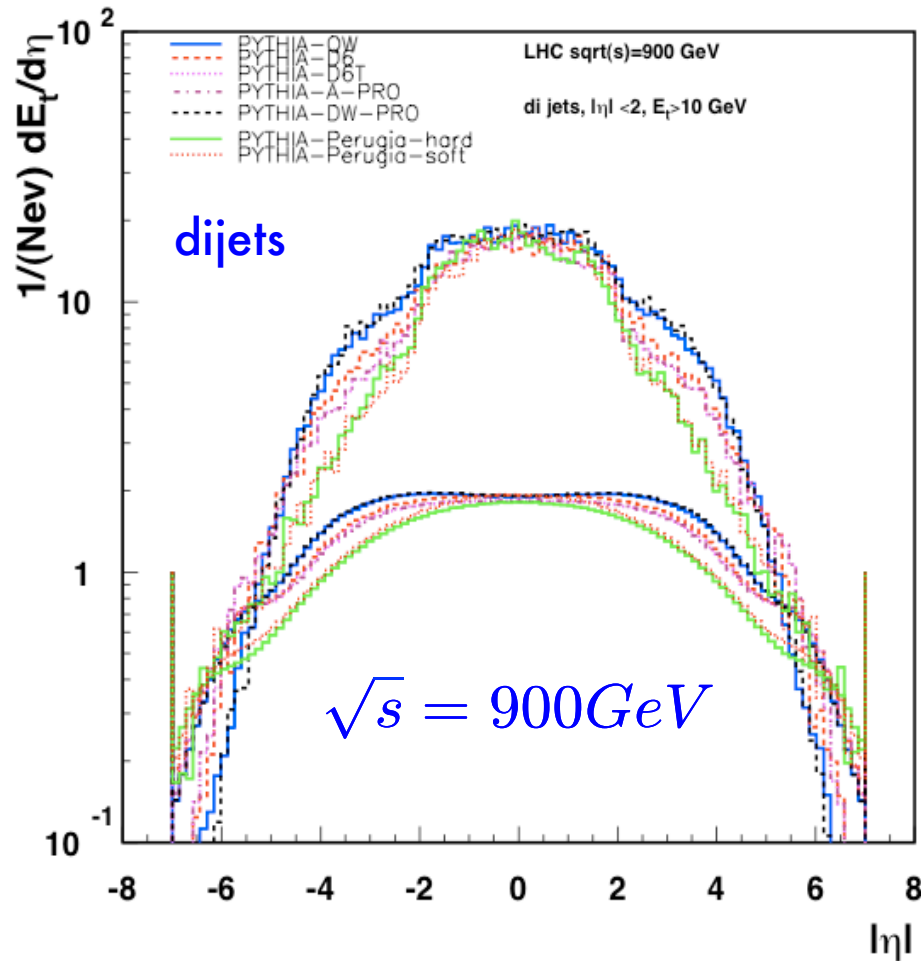
- use dijets with $E_t > 10$ GeV, $|\eta| < 2$, only ND contributions are simulated
 - hard diffractive contribution is not simulated in MC !!!!!
 - tail of energy distribution is different... especially in large eta range
- sensitivity to parton radiation: initial state radiation and MPI

Using a hard scale: transverse Et-flow



- Et flow in central region ($|\eta| < 2$) is similar between the tunes
- differences (\sim factor 2) show up in forward regions
- important especially low energies $\sqrt{s} = 900 \text{ GeV}$!?!?!?

Using a hard scale

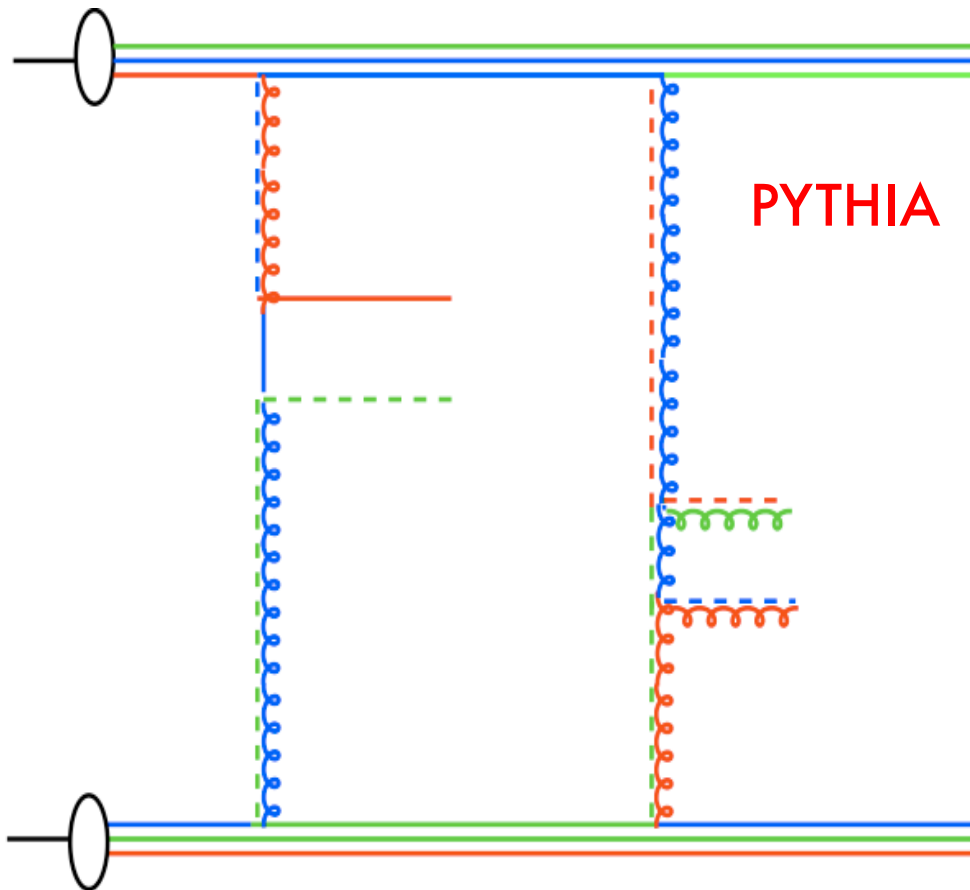


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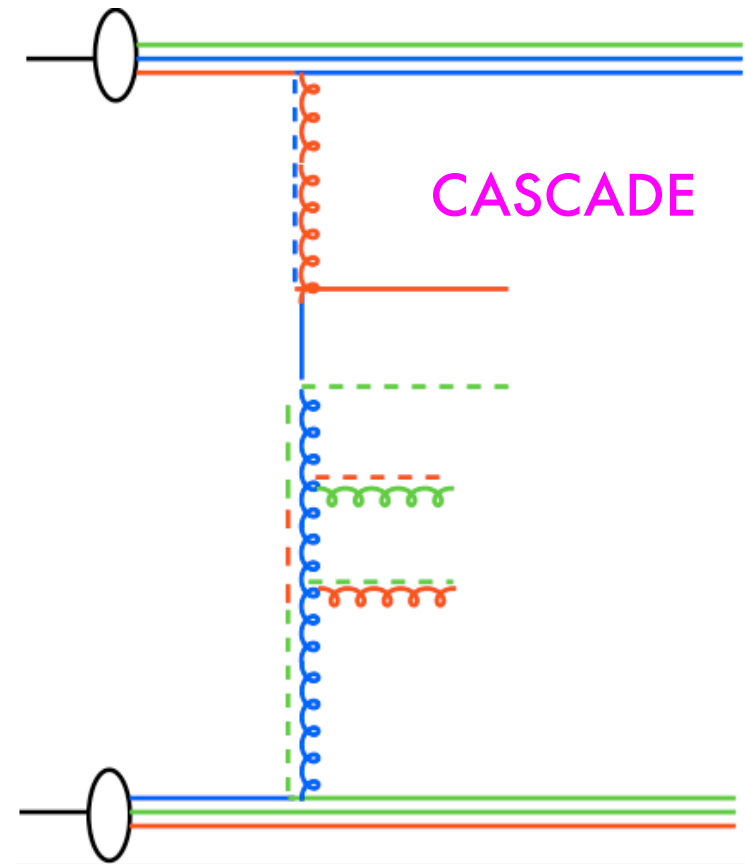
How well do we know parton radiation in forward region ?

- parton radiation in forward region:

multiparton interaction

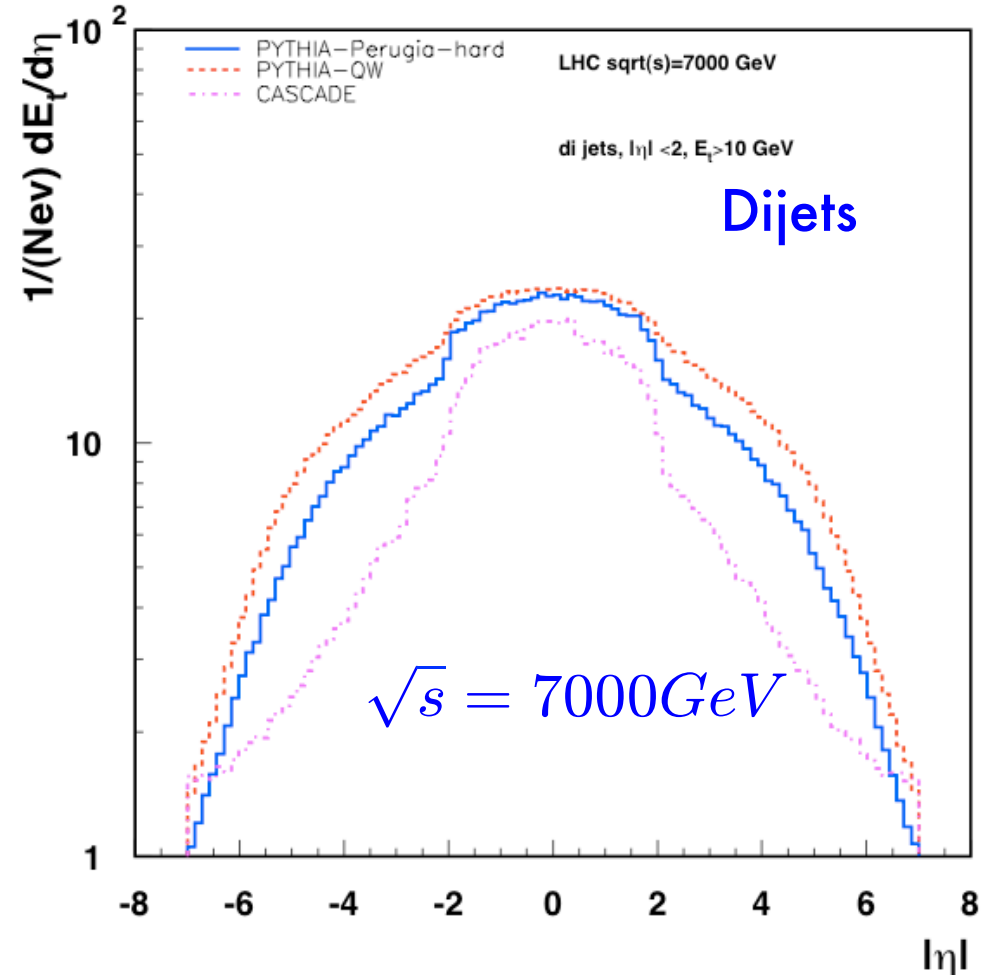
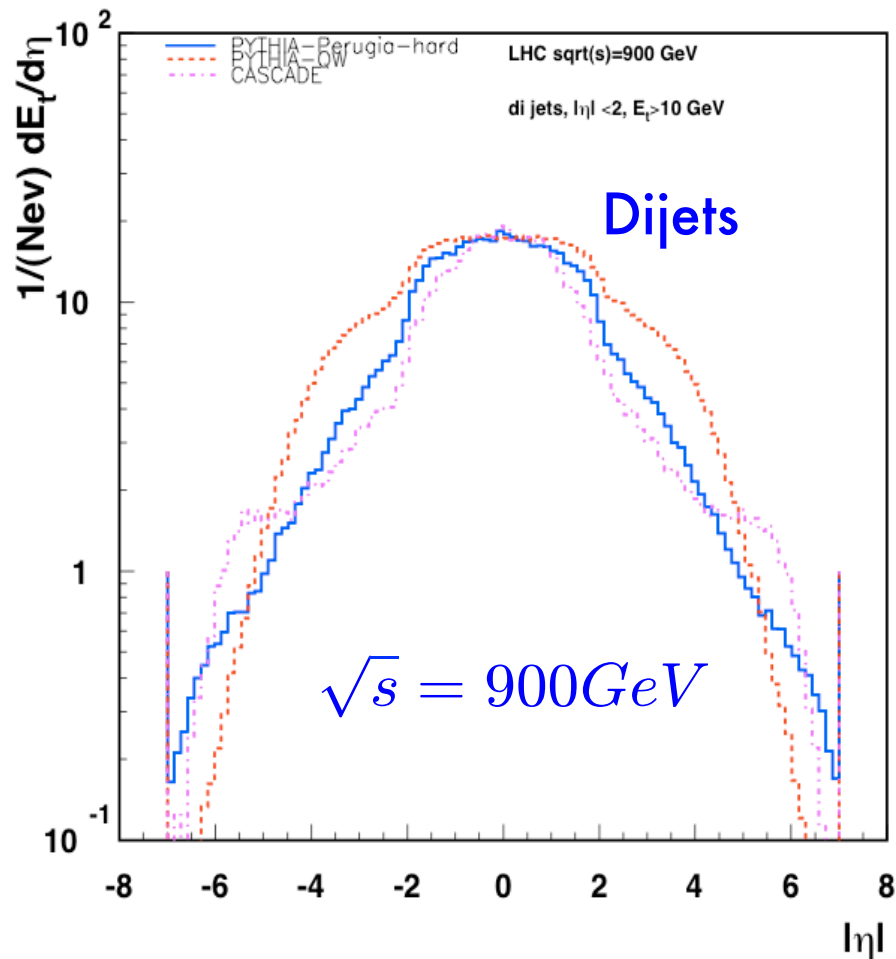


single chain at small x



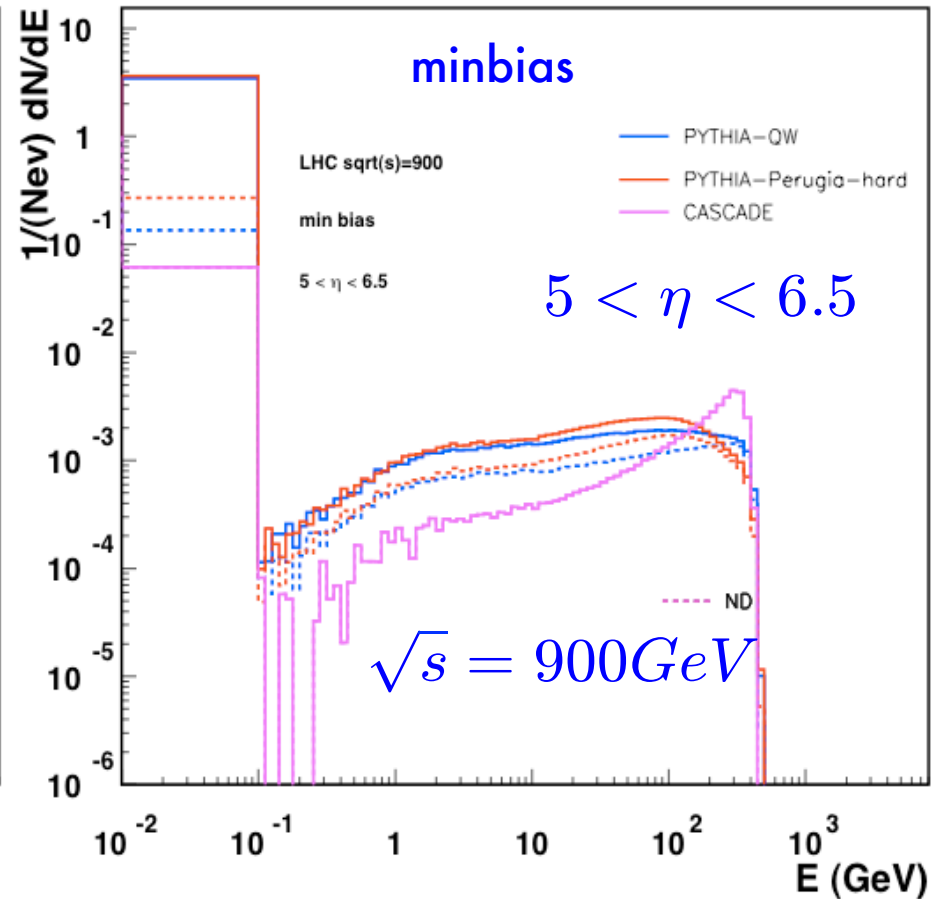
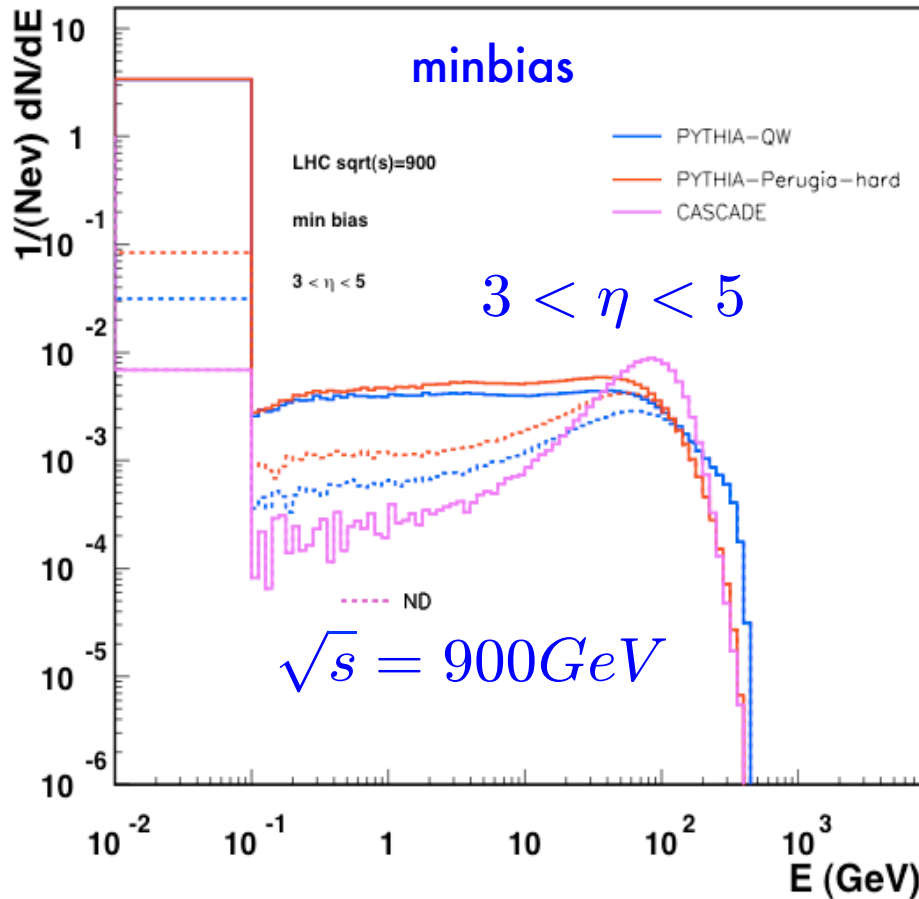
- which of the two is correct or are they both describing the same ... ???

How well do we know parton radiation in forward region ?



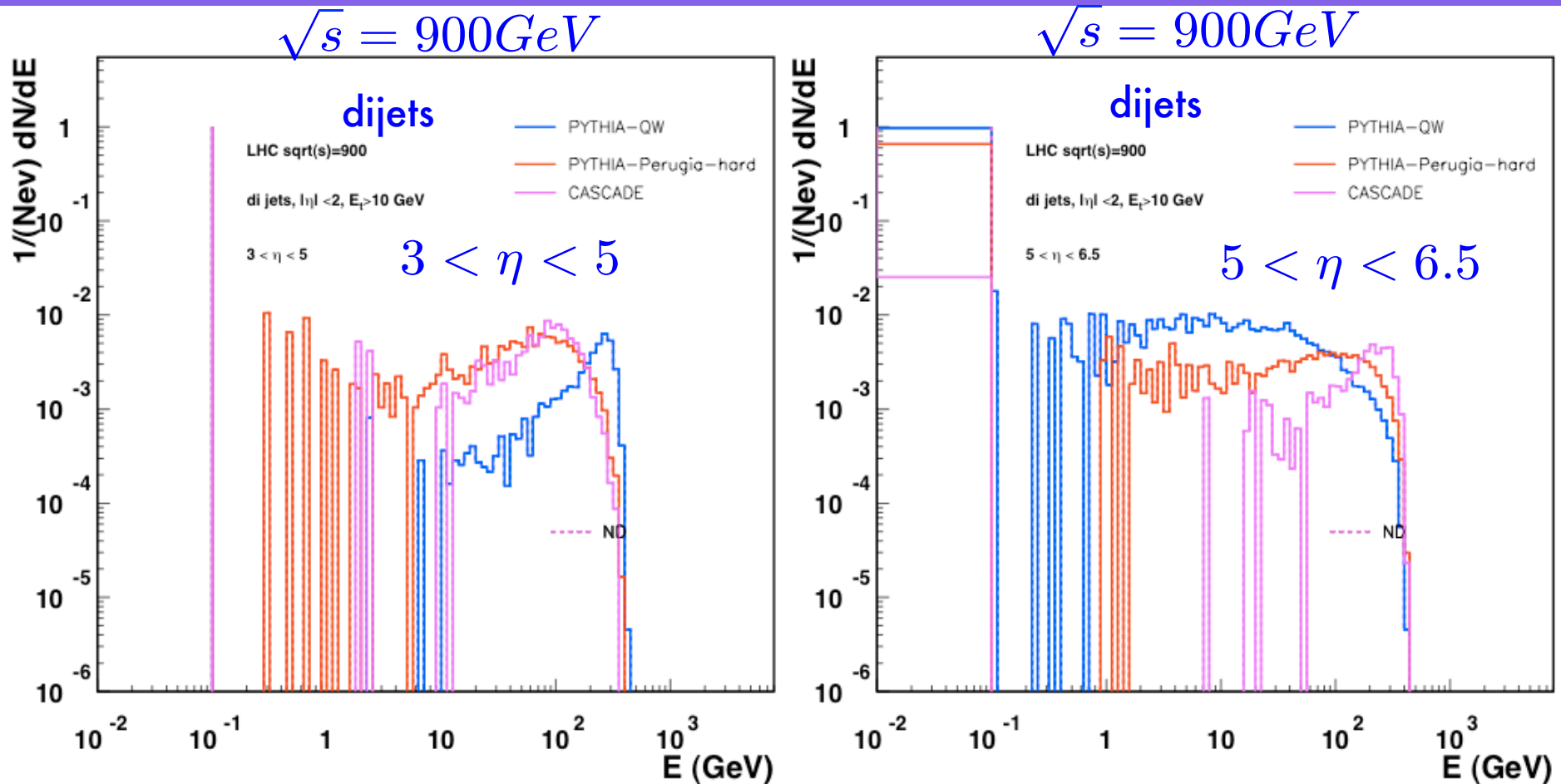
- Can additional radiation in forward region coming from different parton showering (not ordered in kt) ?
- How is the \sqrt{s} dependence of transverse energy flow ?

Parton radiation in forward region



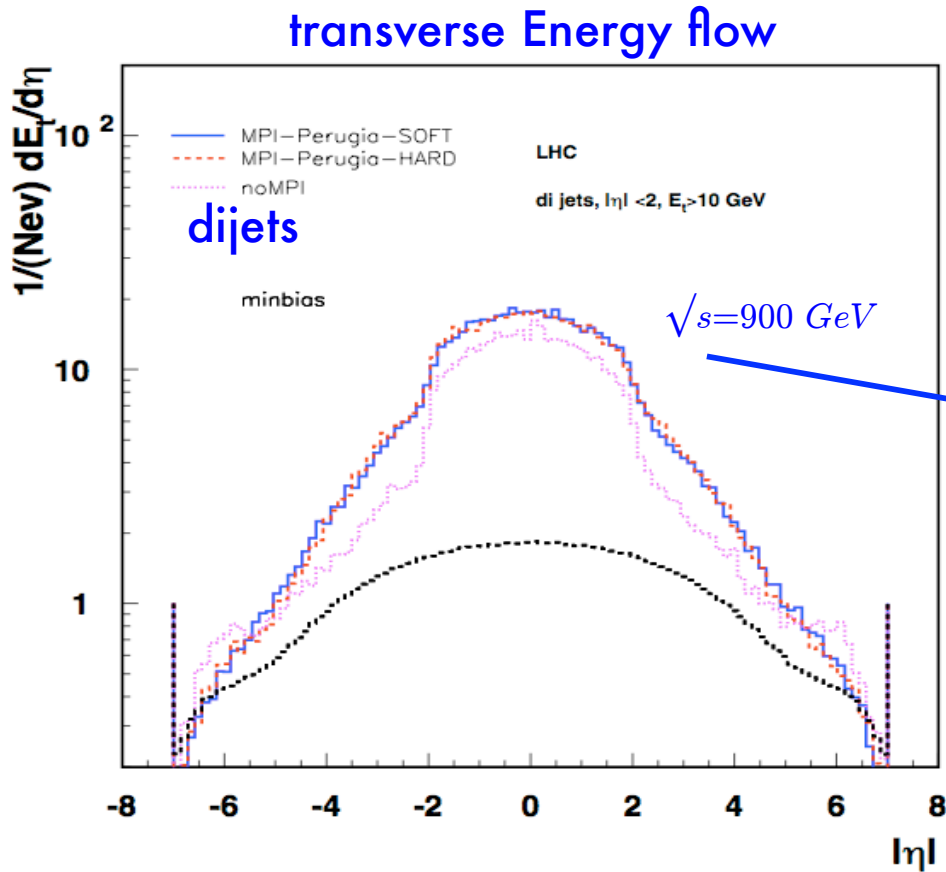
- Energy spectrum in **soft** processes: how large is the contribution from non-diffractive processes ?
- high energy tail can help to constrain !

Parton radiation in forward region

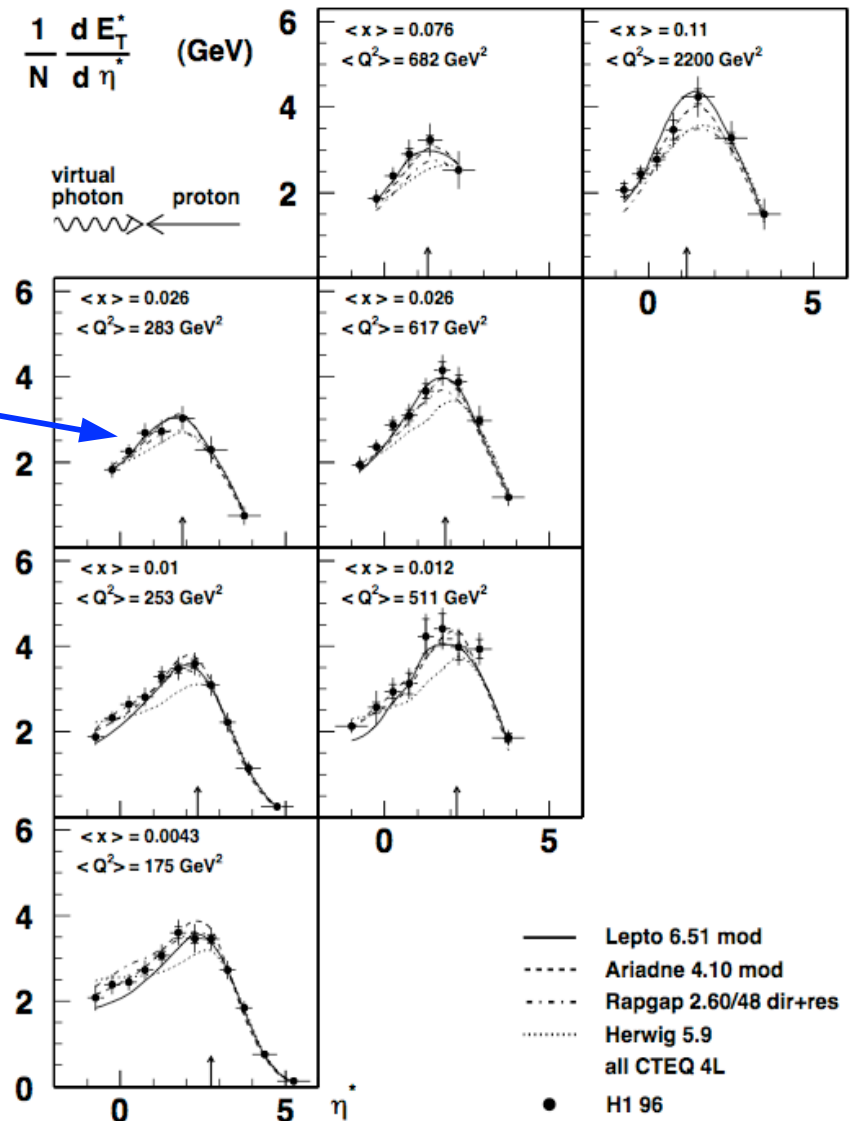


- Energy spectrum in **hard** processes: how large is the contribution from non-diffractive processes ?
- very forward region depends on parton showering etc ...

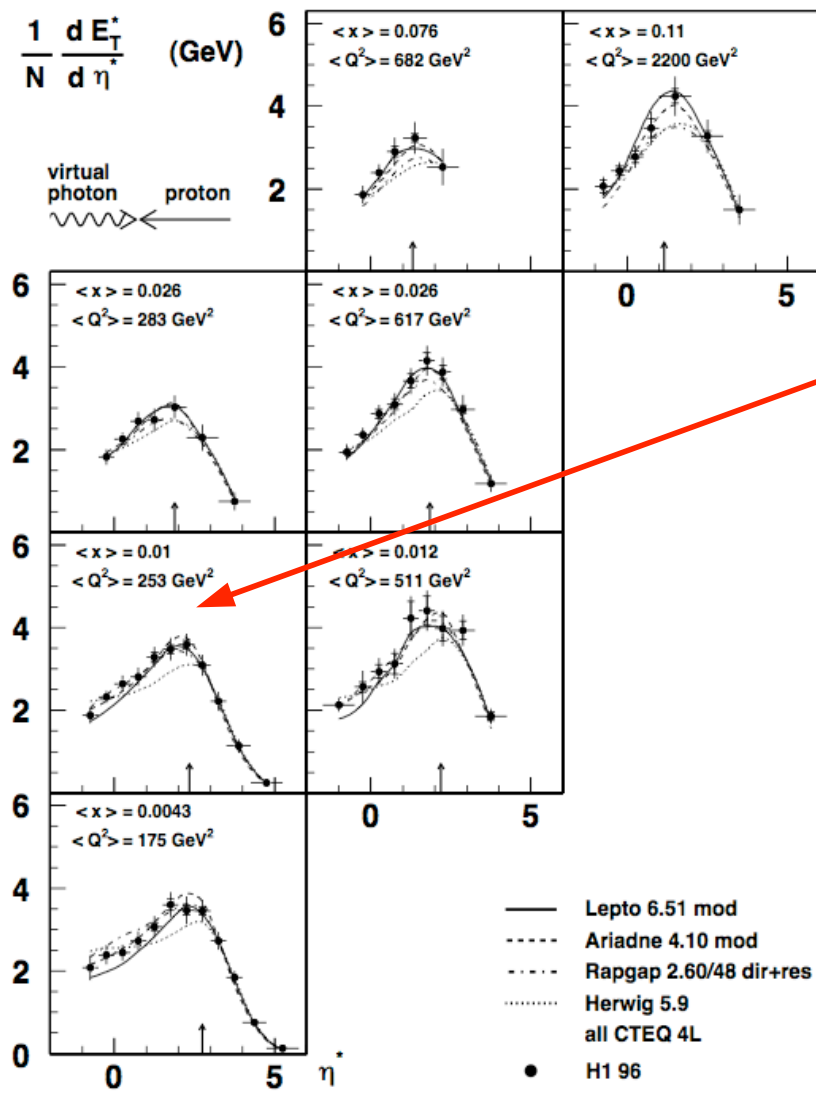
trans. energy flow at 900 GeV - HERA



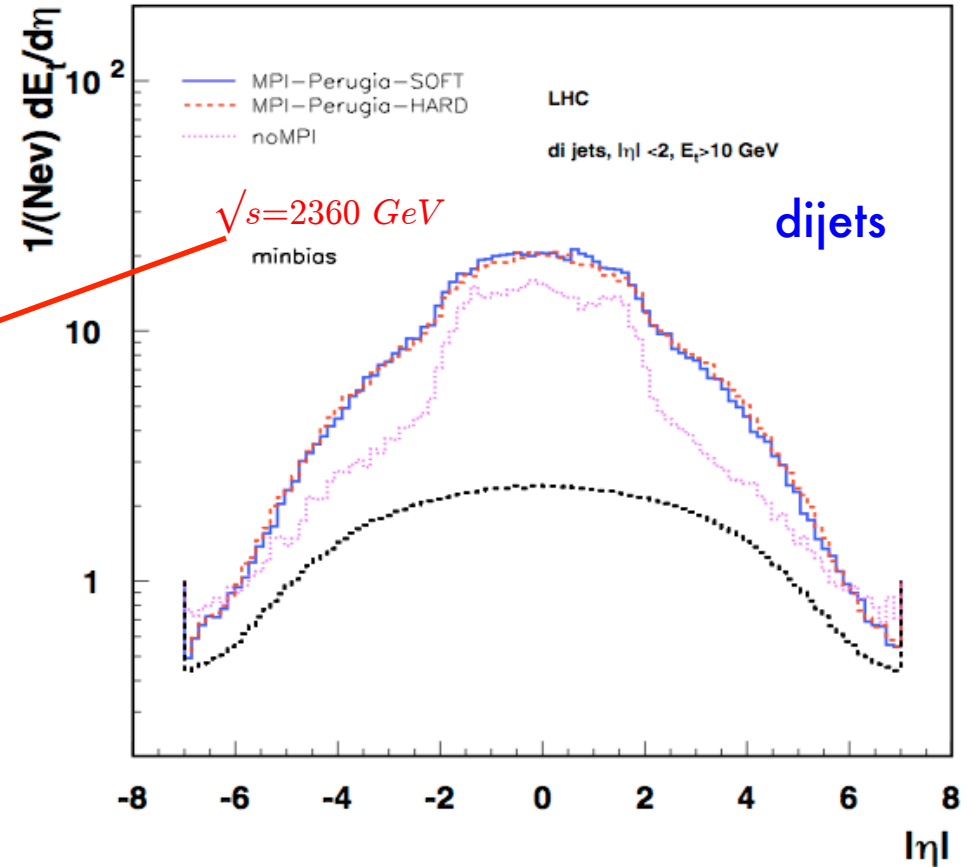
- Trans energy in central region does not change much with \sqrt{s}
- Significant difference with \sqrt{s} seen in region of $|\eta| > 2$



trans. energy flow at 900/2360 GeV



transverse Energy flow



Trans energy in central region does not change much with \sqrt{s}

- Significant difference with \sqrt{s} seen in region of $|\eta| > 2$

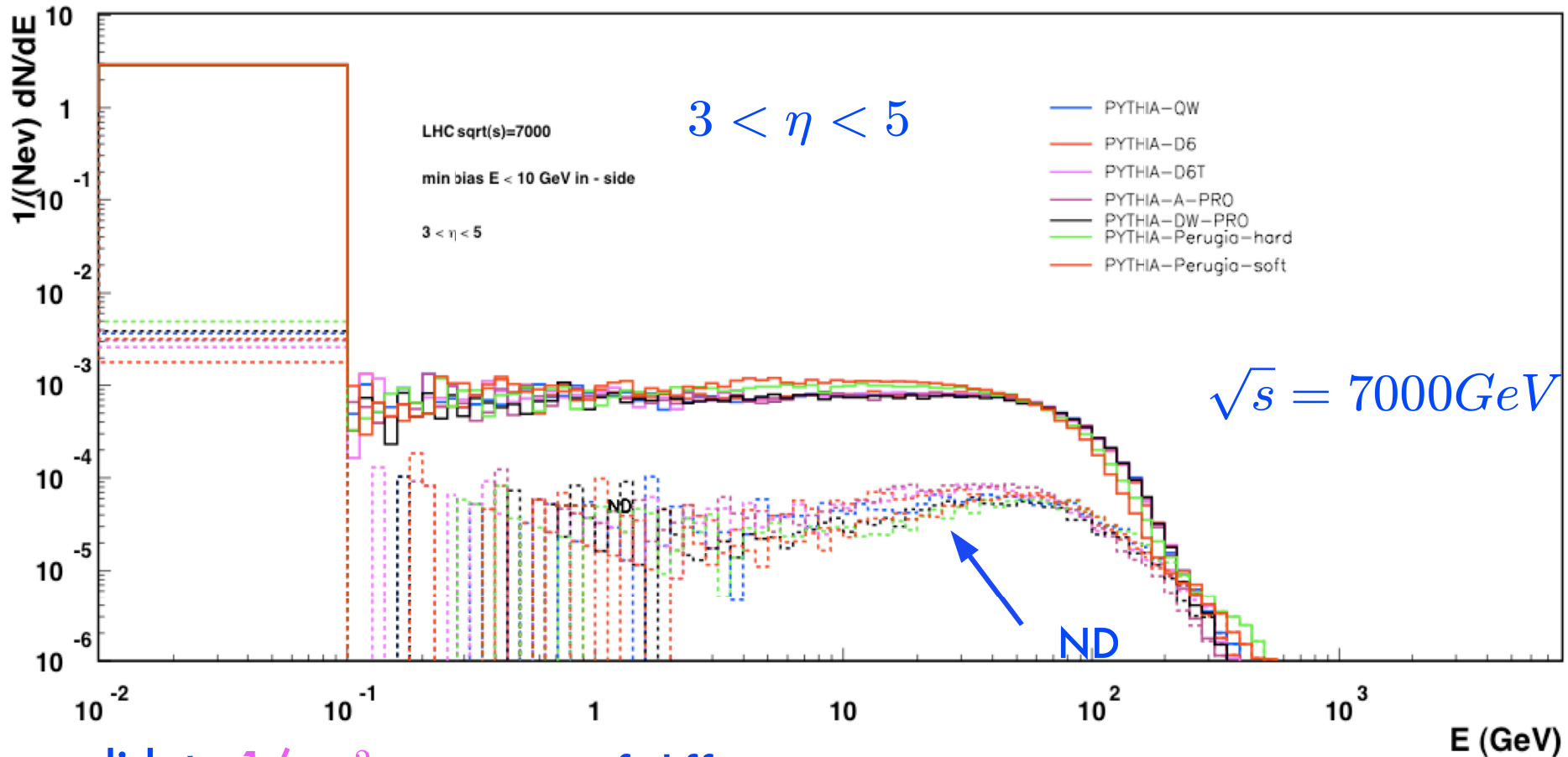
Energy flow in forward region

- **Energy spectrum in forward region:**
 - separate non-diffractive contribution (small energies)
 - sensitive to parton radiation in initial state (large energies)
 - sensitive to UE tunes
 - sensitive to parton shower approach (ordered vrs non-ordered)
- **Transverse energy flow**
 - direct measure of multiparton activities and parton shower
 - direct comparison with E_t flow in ep environment
- **Energy spectrum and energy flow measurements in forward region are complementary to charged particle spectra and UE studies in central region**

Extra Slides

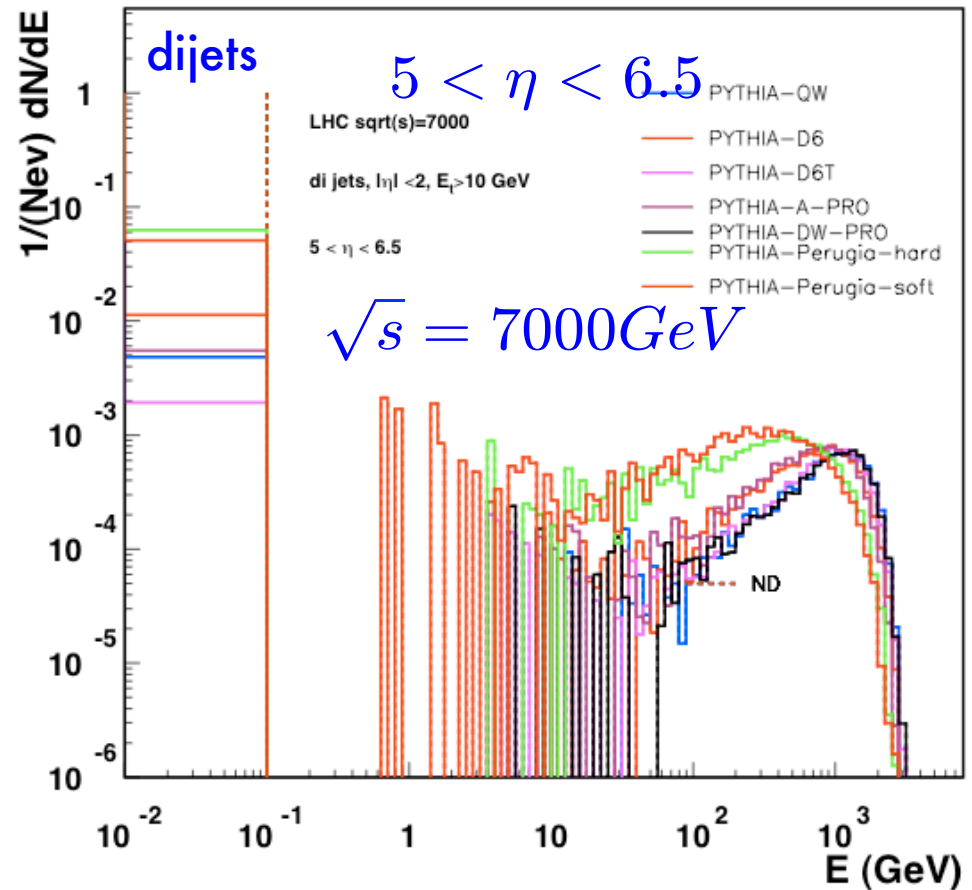
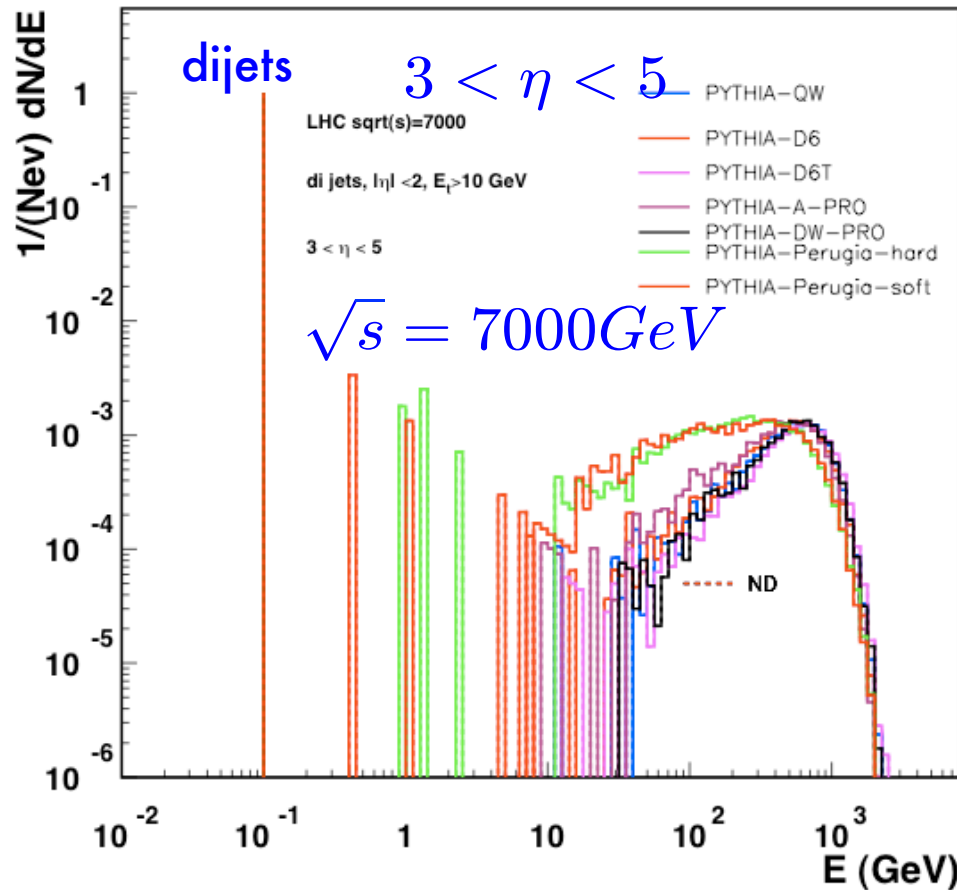
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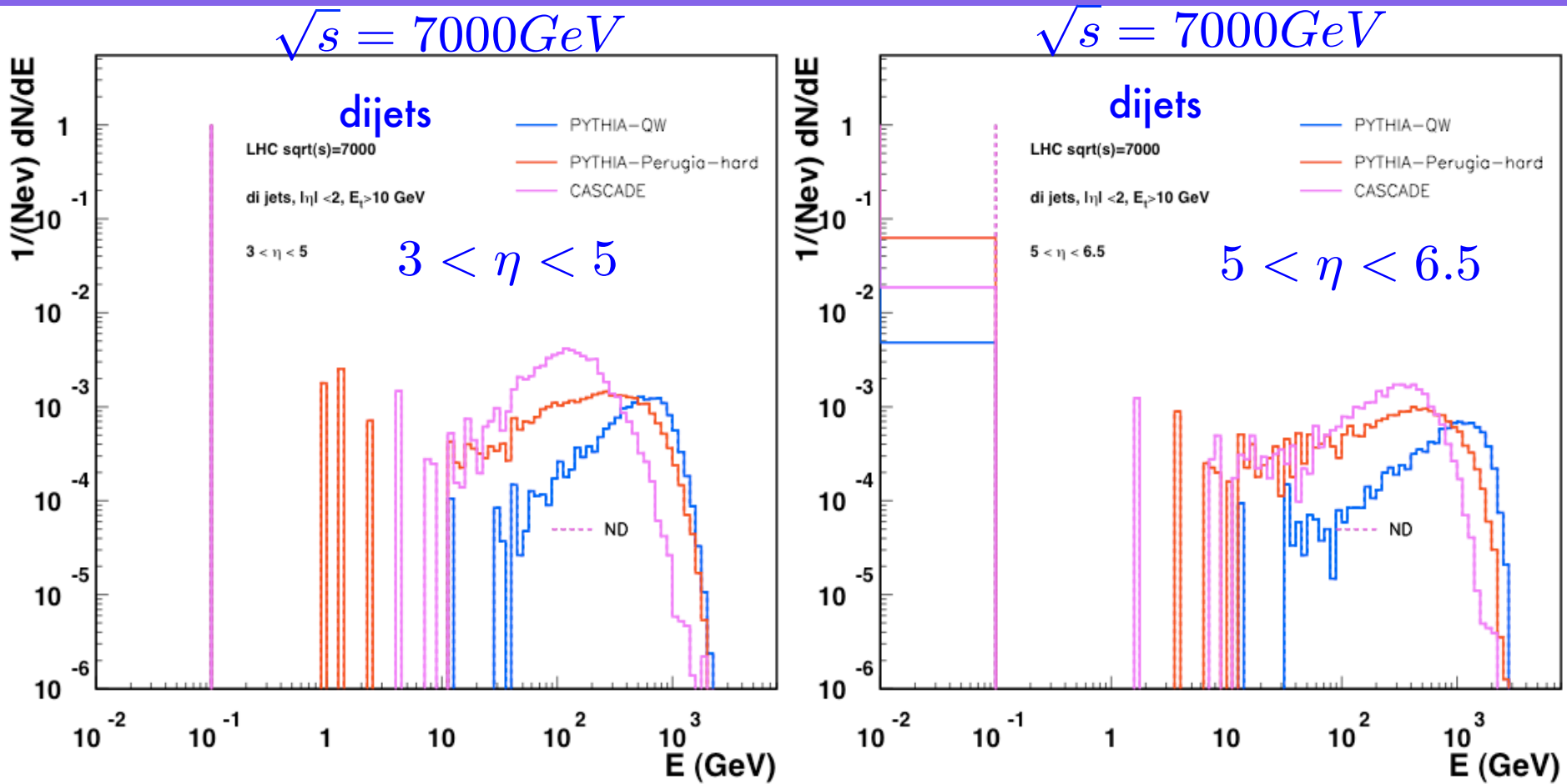
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Parton radiation in forward region



Energy spectrum in hard processes. How large is the contribution from non-diffractive processes ?

- very forward region depends on parton showering etc ...